Bossier Parish Community College
Master Syllabus

Course Prefix and Number: CHEM 108 **Credit Hours:** 3

Course Title: Introductory Organic and Biochemistry

Course Prerequisite: CHEM 107or CHEM 101 or equivalent course

Textbook: Denniston, Topping, & Caret; Organic, and Biological Chemistry, 6th edition

Course Description:

An introduction to organic and biochemistry for allied health and nursing majors. Emphasis is placed upon recognizing and drawing organic and biochemical compounds, chemical reactions of these compounds, IUPAC and common nomenclature, and processes important in the makeup and function of living systems.

Learning Outcomes:

At the end of this course, student will

A. classify and contrast organic and biochemical molecules into functional groups and families to predict properties and products of reactions; and
B. determine and explain the affects and roles of organic and biochemical molecules in the human body, including the mechanisms by which the body obtains energy.

To achieve the learning outcomes, the student will

1. classify organic molecules into functional-group families. (A)
2. recognize the main carbon chain in a molecule and identify constitutional isomers. (A)
3. draw structures given the name or a condensed or line structure. (A)
4. recognize and list the general physical properties of the alkanes and cycloalkanes. (A)
5. predict the products of combustion and halogenation reactions of alkanes. (A)
6. recognize structures of the three classes of unsaturated organic compounds, alkenes, alkynes, and aromatic compounds. (A)
7. draw structures given the name or given the structure be able to name the compound. (A)
8. identify cis/trans isomers and predict their occurrence. (A)
9. recognize and list the general physical properties of the alkenes, alkynes, and aromatic compounds. (A)
10. predict the products of reactions of alkenes, alkynes and aromatic compounds. (A)

11. predict the products of polymerization reactions of alkenes. (A,B)
12. recognize structures of alcohols, phenols, ethers, sulfur-containing compounds. (A)
13. draw structures given the name or given the structure be able to name the compound. (A)
14. recognize and list the general physical properties of the alcohols, phenols, ethers and thiols. (A)
15. predict the products of reactions of alcohols, both dehydration and oxidation. (A,B)
16. describe the differences in properties among the alcohols, phenols and ethers with respect to polarity and hydrogen bonding, water solubility, boiling points, and acidity. (A)
17. recognize and draw the important families of carbonyl compounds. (A)
18. describe the properties such as polarity, hydrogen bonding, boiling point, and water solubility. (A)
19. name simple members of these families and write their structures given the names. (A)
20. predict the products of oxidation and reduction reactions on both aldehydes and ketones and their addition of alcohols. (A,B)
21. recognize hemiacetals and acetals, describe the conditions necessary for their formation, and predict the products of acetal hydrolysis. (A,B)
22. predict the products of polymerization reactions of aldehydes. (A,B)
23. recognize and draw the important carboxylic acids and esters. (A)
24. describe the properties such as polarity, hydrogen bonding, boiling point, and water solubility. (A)
25. name simple members of these families and write their structures given the names. (A)
26. recognize and demonstrate how salts of carboxylic acids are formed and named. (A)
27. recognize esters, describe the conditions necessary for their formation, and predict the products of their hydrolysis. (A,B)
28. recognize thioesters, phosphate esters and anhydrides and explain why they are important in biochemistry. (A,B)
29. recognize primary, secondary, tertiary, and heterocyclic amines. (A)
30. name simple amines and write their structures given the names. (A)
31. describe amine properties such as hydrogen bonding, solubility, boiling point and basicity. (A)
32. predict the products of reactions of amines with water, alkyl halides or acid. (A,B)
33. recognize ammonium salts and draw their structure given the name. (A)
34. recognize selected biologically important amines from their structures. (A)
35. name simple amides and write their structures given the names. (A)
36. predict the products of hydrolysis reactions of amides. (A,B)
37. predict the products of polymerization reactions of amides. (A)
38. define the main classifications of carbohydrates and classify specific examples. (A)

39. explain why carbohydrates exhibit chirality, and demonstrate with Fischer projections. (A)
40. illustrate the structures of the monosaccarides glucose, fructose, maltose and ribose, in both D and L forms and in both the Haworth and Fischer projections. (A)
41. recognize a reducing sugar and describe its oxidation. (A)
42. predict the product of a given glycoside-forming reaction and classify the glycosidic bond formed. (A,B)
43. draw the structures of the disaccharides maltose, sucrose, lactose and cellobiose. (A)
44. describe the structure of cellulose, starch, and glycogen and how they differ. (B)
45. recall the names and structures of the different types of lipids. (A)
46. describe the general structures and general properties of waxes, fats and oils. (A)
47. list the most important reactions of these lipids and given the reactants predict the products. (A,B)
48. recognize the general structure of steroids, prostaglandins and leukotrienes and describe some of their functions. (A)
49. draw the general structure of plasma membranes and draw the structures of the lipids they contain. (A)
50. recognize and give some representative structures of amino acids. (A)
51. describe how the properties of amino acids vary with their side chains and how their ionic charges vary with pH. (A,B)
52. recognize handedness in molecules and explain what is responsible for handedness. (A)
53. use structural formulas to show the primary structure of proteins. (A)
54. recognize and demonstrate the types of bonding that stabilize secondary, tertiary and quarternary structure in proteins. (A)
55. understand the denaturation of a protein and the ways to cause denaturation. (B)
56. describe the general structure of an enzyme and their function in biological reactions. (A)
57. name the classes of enzymes and describe the type of reaction catalyzed be each. (B)
58. recognize and demonstrate the two models for enzyme specificity, and the characteristics of each. (B)
59. predict the effect on enzyme activity when temperature, pH, enzyme concentration, and substrate concentration gradually change. (B)
60. describe enzyme inhibition, feedback control, and allostearic control. (B)
61. discuss the types of vitamins and their roles in biochemical reactions. (B)
62. identify and draw the components of nucleosides, nucleotides, DNA and RNA. (A)
63. describe the double helix and base pairing in DNA. (A)
64. explain the genetic code and predict an amino acid sequence given the DNA or RNA. (B)
65. describe the 8 steps in protein synthesis. (A,B)

66. identify the major parts of the eukaryotic cell, and describe the structure of the mitochondria. (B)
67. explain and give examples of the roles of ATP, coupled reactions, and oxidized and reduced coenzymes in metabolic pathways. (B)
68. reproduce all the reactions of the citric acid cycle, the names of the enzymes and coenzymes at each step, and explain the role of the citric acid cycle in energy production. (A,B)
69. relate the respiratory chain, oxidative phosphorylation, and their coupling according to the chemiosmotic theory. (B)
70. identify where carbohydrates are digested and what the major products are. (A,B)
71. reproduce the pathway for the breakdown of glucose, with the enzyme names and coenzymes for each step and to know which steps are energy using and which are energy producing. (A,B)
72. recall three hormones that influence glucose metabolism and describe their roles. (B)
73. recognize and demonstrate the reactions necessary to catabolize glycogen, and the major products of the pentose phosphate pathway. (A,B)
74. list the sequence of events in the digestion of triacylglycerols and their transport into the bloodstream. (B)
75. reproduce the reactions in the oxidation of a fatty acid to acetyl-CoA. (A,B)
76. calculate the energy yield in ATP from a given fatty acid. (B)
77. list the sequence of events in the digestion of proteins. (A,B)
78. describe transamination of amino acids and be able to draw the structures of the products of transamination. (A)
79. summarize the urea cycle reactants and products. (A,B)

Course Requirements

- minimum 70% average on tests
- minimum 50% on comprehensive final test
- minimum of 70% completion of assigned homework

Course Grading Scale:

A- 90% or more of total possible points with a minimum of 50% on the comprehensive final exam and satisfactory completion of at least 70% of assigned homework

B- 80% or more of total possible points with a minimum of 50% on the comprehensive final exam and satisfactory completion of at least 70% of assigned homework

C- 70% or more of total possible points with a minimum of 50% on the comprehensive final exam and satisfactory completion of at least 70% of assigned homework

D- 60% or more of total possible points with a minimum of 50% on the comprehensive final exam and satisfactory completion of at least 70% of assigned homework

F- less than 60% of total possible points or less than 50% on the comprehensive final exam or failure to complete at least 70% of assigned homework

Reviewed by K. Franks/ May 2009